RESEARCH PROGRESS REPORT
For Administrative Use

1961 REPRODUCTIVE SUCCESS IN NORTH AMERICAN GEESE

Winter Appraisals of Productivity

(Observers listed in Part X)

Compiled by

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INTRODUCTION (AND ABSTRACT)

In the summer of 1961, reproductive success among N. American geese was seldom better than "fair", and in some cases was decidedly poor. Nesting conditions apparently were unsatisfactory in many parts of the Arctic breeding grounds of these geese. Only those species having very extensive and diversified nesting ranges seemed able to escape the full brunt of the debacle. Yet the populations of most geese will enter the 1962 breeding season with some great advantages.

Nesting success in the geese is appraised each year during the fall migration period and on the wintering grounds, rather than on the remote breeding-grounds. Since the first-winter young in many species have plumage different from that of older birds, and since the social structure in geese is so organized that families and other functional groupings of birds endure throughout the winter, it is possible to determine, from winter observations, goose-mortality and productivity for the past calendar year. Winter surveys are described in report "Winter Appraisals of 1960 Productivity in North American Geese", Lynch, et al. (mimeo; copies on file at Patuxent Research Center, Laurel, Maryland and Lafayette, Louisiana).

Appraisals of 1961 productivity were carried on by many cooperators (see Part X, Contributors), and all field activities were coordinated by the 4 Flyway Representatives of the Bureau of Sport Fisheries and Wildlife. Final compilation and analyses of data were undertaken at the Lafayette (La.) station of Patuxent Wildlife Research Center. The 1961 surveys produced a complete (Continental) annual picture for the blue goose (Chen caerulescens), Western and Atlantic snows (C. hyperborea and C. h. atlantica), and the white-fronted goose (Anser albifrons). Information for the swans, brants and some other waterfowl was also sought. These surveys also demonstrated their worth for appraising annual productivity among the canada geese (Branta canadensis, and subspp.).

NOTE: Nomenclature follows AOU Checklist, except in Section IV.

I. 1961 PRODUCTIVITY IN THE BLUE GOOSE*

The blue goose came out of the 1961 season with a very poor nesting record. Only once in the past 15 years (in the almost-total nesting failure of 1954, Table 10) has this species had worse luck.

Those blues that came to Louisiana in the fall of 1961 were mostly adults and subadults. In many wintering flocks, as few as 2% of geese were young from the 1961 hatch, and nowhere in Louisiana did 1961 young amount to more than 10% of wintering blues (Table 2). On the Texas coast, young ranged from 11% to 20% of total blues (Table 3), indicating that the species had slightly better success this past summer in the more westerly portions of its breeding range. In the final fall 1961 analysis (Table 1), only 7% of Continental blue geese proved to be 1st-winter young.

Broods were quite small in all wintering concentrations, and the average fall 1961 blue goose family had only 1.55 goslings. Of adults that should have been mature enough to nest in 1961, a relatively small number (11.4%) brought broods to the wintering grounds. It had been suggested in our 1960 Report that of the 532,000 blues that started calendar year 1961, only 360,000 would be mature enough to nest that year, and half of these would be nesting for the first time in 1961 and could not be expected to be as successful as older birds if breeding conditions proved unfavorable. But it is now obvious (Figure A) that many potential breeders of all ages were unsuccessful. If for purposes of discussion we consider blues from the 1960 hatch to have been too immature to nest, and those from the 1959 hatch to have been too inexperienced for successful nesting in 1961, the 27,600 productive adults we recorded in December 1961 amount to less than one-fourth of blue geese calculated to have been 36 months of age or older as of June 1961. Or, to put it more simply, 3/4 of the "old-timers", as well as most of the inexperienced breeders, seem to have lost out in the ill-starred 1961 nesting. At first glance this is dismaying news.

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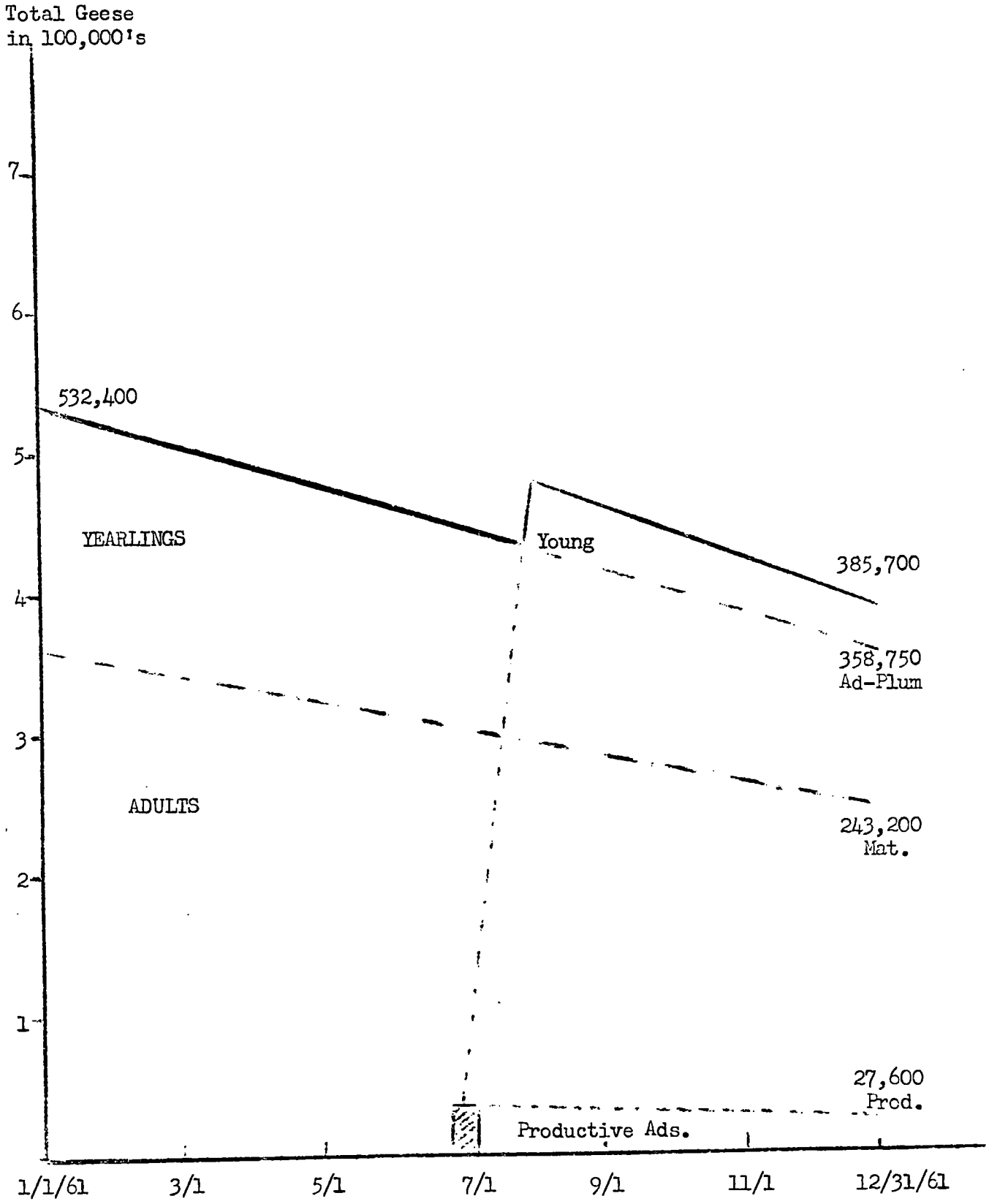
*Surveys started by Lynch in 1937; current appraisals in Louisiana by Lynch, Andrews, Chabreck, Hoffpauir, Myers, Smith, Valentine, and other cooperators, and in Texas by Stutzenbaker, Chamberlain and cooperators.

Figure A. 1961 Season, Blue Goose



But as we look ahead to the 1962 nesting we begin to see, in the biotic potential of these geese, the remarkable resilience that contributes to their great biological security. Far from being discommoded by the poor nesting just past, the blue goose goes into its next season with almost 360,000 adults, most of which will be ready to nest by June 1962. This figure is greater by 100,000 birds than the long-term average (Jan. level) of 260,000 potential breeders. It is far more substantial than the breeding populations (283,000 and 239,000 respectively) that produced the great hatches of 1959 and 60. While the January 1961 figure for potential breeders was also in the neighborhood of 360,000 birds, only 1/3 of those could have been considered "old-timers" that had one or more nesting seasons behind them; now, of the same number of "potential breeders" going into the 1962 season, about 2/3 will qualify as "experienced". Given favorable nesting conditions, the blue goose should do quite well in the 1962 nesting season, and will not feel the impact of its 1961 reproductive failure until 1963.

II. 1961 PRODUCTIVITY IN THE WESTERN ("LESSER") SNOW GOOSE*

Those snow geese that winter in North America west of the Mississippi River had somewhat better nest success in the 1961 season. Of their fall population, nearly 20% proved to be young birds. However, this 1961 lesser snow nesting could scarcely be called outstanding. Snow families averaged only 1.77 goslings at the time of fall 1961 surveys, and slightly over one-third (38%) of adults eligible to nest in 1961 brought broods south to the wintering-grounds. Even if the "new" adults from the 1959 hatch are discounted, the 135,500 productive adults present at the end of calendar year 1961 (Figure B) represent less than two-thirds (64%) of snows that should have been experienced breeders (36 months of age or older) as of June 1961.

There was remarkable agreement this fall between the appraisal records for Pacific snow geese, and those for the Central Flyway snows that wintered on the Gulf Coast of Texas (Tables 4, 5 and 6). These data suggest that 1961 nesting conditions in the Western Arctic, while far from extraordinary, were at least adequate.

Some lesser snows, especially of colonies at the eastern edge of the nesting range, had very poor success in 1961. When they arrived in Louisiana for the winter, these easternmost snows showed every evidence (Table 4) of having suffered from the same nesting troubles that plagued the blue goose. Only 5% of these Louisiana snows were young from the 1961 nesting. (It might be noted at this point that winter appraisals of "snow goose productivity" promise to become somewhat unrealistic in Louisiana; while inventories continue to record from 40,000 to 60,000 snows wintering in that State, an ever-increasing proportion of these birds show up not in our snow goose records, but rather in "Blue-Snow" families and other mixed groupings; this matter is discussed further in Part IV.)

The lesser snow faces the 1962 nesting season with equanamity. Its January 1962 level of "potential breeders" stands at 586,600 adults and maturing subadults, a figure greater by almost one-third (31%) than the 6-year average of 447,000 potential breeders. Furthermore, the level of experienced breeders (36-months or older) is correspondingly high for the lesser snow, as has already been explained in our Blue

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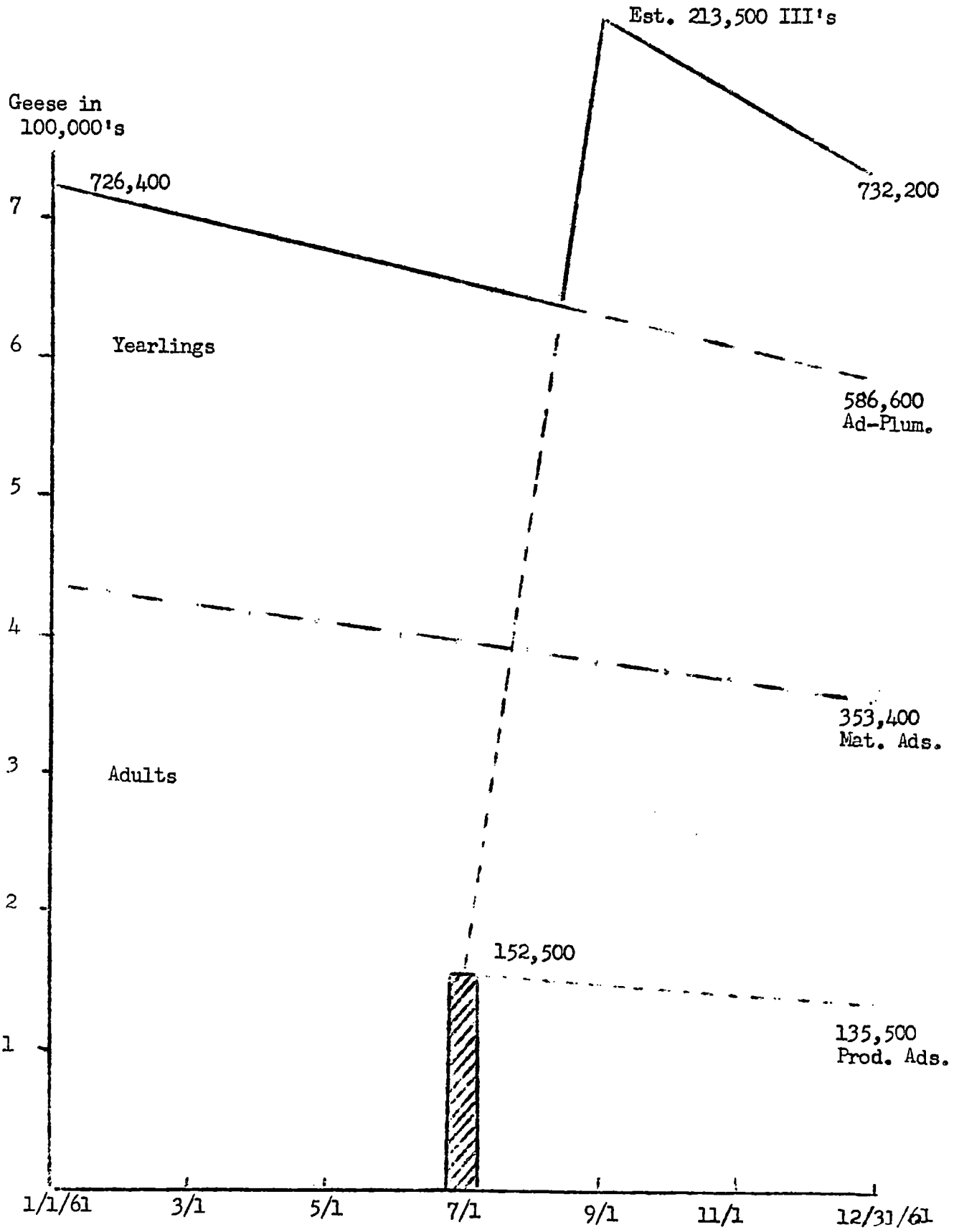
*Pacific Surveys by Jensen and cooperators; Gulf appraisals by Stutzenbaker, Chamberlain, Lynch and cooperators.

Figure B, 1961 Season, Lesser (Western) Snow Goose



Goose discussion (Part I). Just as a year of nesting failure exerts a "delayed reaction" in a goose population, so also do the years of great nesting success. Those adolescent snow geese produced by the splendid nestings of 1959 and 1960 are now fully mature and in many cases are experienced and resourceful breeders, and their great numbers should serve to cushion the impact of the relatively poor 1961 season.

These breeders will be deployed over a nesting range that spans much of the top-side of North America, and even portions of Siberia (Figure E). It is difficult to conceive of any combination of weather, predation, or other unfavorable factors that would utterly thwart nesting in any one season over so vast a stretch of "waterfowl real-estate". While alarm is often voiced at the precarious status of the Arctic-nesting waterfowl, the lesser snow is one bird that has attained considerable "biological security" via the route of splendid "nesting geography". The species also enjoys great numerical strength, a feature that certainly contributes to security but probably originated in, and is obviously maintained by, good "nesting geography".

III. 1961 PRODUCTIVITY AMONG ATLANTIC SNOW GEESE*

There is no need to dwell at length on this subject. Figure C portrays in rather dramatic fashion the almost total failure of the 1961 nesting of greater snow geese, and of such lesser snows as may winter with them on the Atlantic Coast of the U. S. Table 7 documents the rather dismal details (1.2% young, average brood only 1.5, etc.), if anybody is interested.

And we should be interested, not so much in what happened to these geese in 1961, but rather in why it happened. Bad weather is no novelty in the Far North. Even in the years that are generally favorable for the Arctic-nesting birds, a few localities will be bedeviled by storms. A certain amount of nest predation may be anticipated every year somewhere in the North. These factors are important, of course, and it would be most unwise to belittle them. But of much greater importance, from the standpoint of conservation and management of the Arctic nesters, is the ability of species to cope, year after year, with all unfavorable nesting conditions regardless of the nature and extent of the latter.

The Atlantic snow geese have great "staying-powers". While they represent a relatively small population (35,000 to 67,000 birds at midwinter in recent years, Table 12) they have the resilience that is so characteristic of other goose, brant and swan populations. Thus the Atlantic snows are going into the 1962 nesting season in a very strong position; they now have 49,000 potential breeders, whereas the average potential in recent years has been only 34,000 birds. This 1962 figure is substantially better than the 1961 level of 44,000 not only in total numbers, but also in its currently high percentage (66%) of potential breeders that can qualify as experienced nesters.

So the Atlantic snows could face the 1962 season with some confidence, were it not for the ever-present threat of unfavorable summer weather on their rather limited nesting grounds. The known breeding-range of the greater snow goose is apparently so circumscribed that one single Arctic weather-system could thwart an entire summer's nesting effort. It may be said that the position of the greater snow goose will remain precarious, no matter what level of abundance it temporarily manages to attain. From this population we may some day learn that abundance alone does not constitute biological security in a species, nor can abundance by itself serve as a substitute for good nesting geography.

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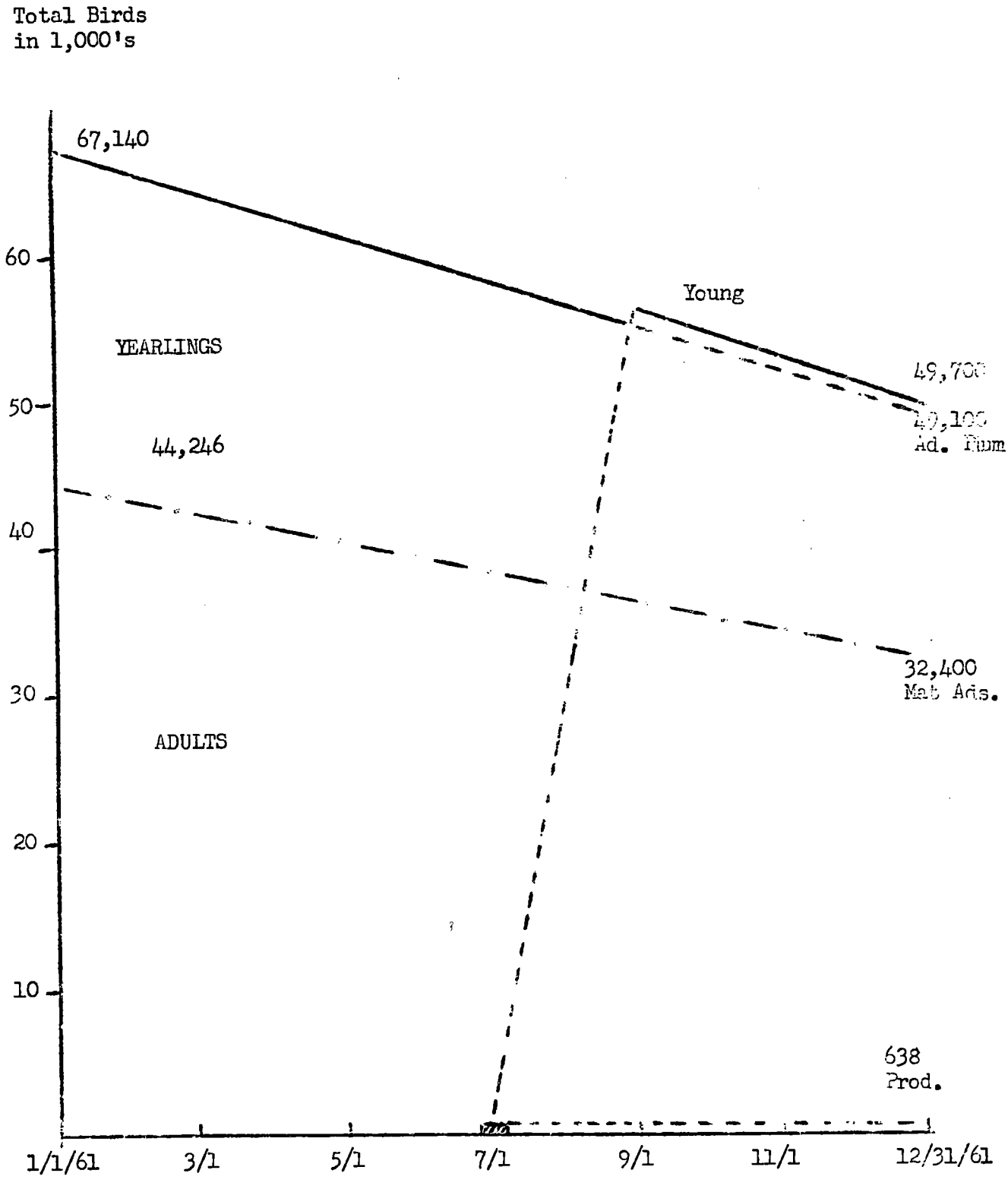
*Surveys by Addy and cooperators

Figure C. 1961 Season, Atlantic Snow Geese



So, while conservationists and wildlife managers go on alternating between excitement in the good nesting seasons of the Atlantic snow, and gloom during its poor seasons, this population will continue to "run scared" until somebody sees fit to arrange for greater diversification and wider geographic spread of its presently limited and therefore vulnerable breeding range (Figure E).

PART IV. THE BLUE-SNOW COMPLEX

The blue goose and the snow goose are considered by some authorities (1/) to be color-phases of one species, Anser coerulescens. Our winter appraisals in Louisiana and Texas, where the 2 color phases are found together, often are able to record "blue x snow families" and other mixed blue-snow groupings, as well as productivity for the pure blue and pure snow aggregates. A summary of past records of mixtures was presented in our 1960 Report, Tables 29 and 30. Mixed blue-snow groups were again tallied in the 1961 appraisals, but families (mixed or otherwise) were so scarce that fall that the information is hardly of interest to the casual reader (altho it is available at Lafayette, should geneticists or other specialists desire it).

But we have some news from aviculturist C. R. Lynch that will be enjoyed by all students of these birds. For quite a number of years, crippled blues and snows, especially 1st-winter young, have been brought in from the Gulf marshes, and kept at a waterfowl-rearing station at Lafayette, Louisiana for study of plumage changes. Observations of these captive geese have been of great value in the development of our field methods for appraising productivity. The Lafayette avicultural facilities were expanded in the fall of 1961, and the captive blues and snows there soon responded by forming 12 strongly-mated pairs that went all the way through normal courtship in spring of 1962. Most of these defended territories, and some even selected and worked on nest sites. No eggs were actually laid (altho none were really expected this year since these were wild-caught birds that may have to remain in captivity for many more years before they can be induced to rear young). But the selection of mates was a bit startling.

Available at the time pairing started were 36 adult blues (22 males and 14 females), and 6 adult snows (3 M and 3 F). Of the 22 male blues, 7 had been picked up as summer "stay-overs" in July 1961, and so were comparatively new to the flock. Two of the female snows were also new birds, having been added to the flock as adults in the summer of 1961.

1/ Delacour, J. 1954, The Waterfowl of the World, Vol. 1, Country Life Ltd., London, 284 pp.

Once the selection of mates began in earnest, the 3 snow ganders woke up one day to find that all three snow females had quite suddenly paired off with male blues. Of the ganders in these "mixed pairs", one was a normal "dark-bellied" blue, one was a "white-bellied" blue, and the third had underparts intermediate between the other two. These mixed pairs endured throughout the spring, and one of the female snows with her blue mate put on a most convincing show of territorial defense. (The pairs persist as this report is being written. Some partners were inadvertently separated a few days ago and penned apart; they objected most vociferously to this arrangement until allowed to reunite.)

While this small captive flock would hardly be considered representative of a Continental population (blues plus lesser snows) that involves well over a million birds, the pattern of mating is at least suggestive. The blue goose is thought to be infiltrating and gradually replacing the lesser snow, especially in the eastern portion of the nesting range of the latter, thru mixed matings. The rate of replacement of the snow by the blue would be expected to accelerate once the blue became the more numerous color-phase in any area. Among our captives this "rate of replacement" of snows by blues might now be said to be "accelerating in the direction of the ultimate". In the wild, this replacement is so advanced in SE Louisiana that practically all snows tallied in recent appraisals there are in the "blue x snow families" and other mixed groups, leaving hardly any to appear in the records of pure snow groups. A similar situation seems now to be developing in the Vermilion marshes in SW Louisiana.

Geneticists may be interested in the following: Of the 9 blue x blue pairings, there were four instances wherein both mates were dark-bellied birds, four cases with one mate dark-bellied and the other white-bellied, and one splendid pair (one of the most devoted) wherein both "blue geese" were almost entirely white on belly, lower breast, and much of the upper breast. The 3 snow ganders showed no inclination to pair, altho there are still plenty of blue females "not spoken for".

V. 1961 PRODUCTIVITY IN THE WHITE-FRONTED GOOSE*

On the whole, the 1961 nesting of the whitefront was satisfactory. While poor success seems to have been the rule throughout the eastern portions of the breeding range, whitefront productivity was just good enough in the western Arctic to offset all 1961 mortality in the species.

In this report we present, for the first time, a Continental picture of annual mortality and recruitment in the whitefronted goose (Figure D and Tables 8 and 9). This has been made possible by the splendid work of G. Hortin Jensen and his cooperators in the Pacific Flyway, where most whitefronts winter. Our basic knowledge of the species, particularly in Prairie Canada and the Great Plains, has been further advanced by the studies of Alex Dzubin (CWS) and Harvey Miller (BSFW) in Saskatchewan, M. C. Hammond (BSFWS) in the Dakotas, and George Schildman and Central Flyway Council cooperators.

In the fall 1961 surveys, Pacific whitefronts had the most young (36.5% of total geese), the largest families (averaging 2.3 goslings) and the highest percentage of productive adults. The white-fronts that came to Texas to winter showed evidence of lower productivity, while those surveyed in Louisiana in the fall of 1961 had comparatively few young (only 10.7% of total geese). Among the Gulf Coast whitefronts could be seen the same pattern of 1961 productivity that prevailed among blue and snow geese; the least productive flocks were found in the eastern-most portions of the Gulf wintering ranges, while those in Texas had a somewhat better record (Table 8).

As they moved thru Prairie Canada and the Dakotas, fall-migrant whitefronts (undoubtedly Central Flyway birds) showed 15% to 20% young, and broods that averaged 2.8 to 3.2 goslings. These data, from the very extensive observations of Dzubin, Miller and Hammond, show that the relatively low "productivity" figures from wintering-grounds appraisals of these birds were due to low reproductive success, rather than mortality during migration.

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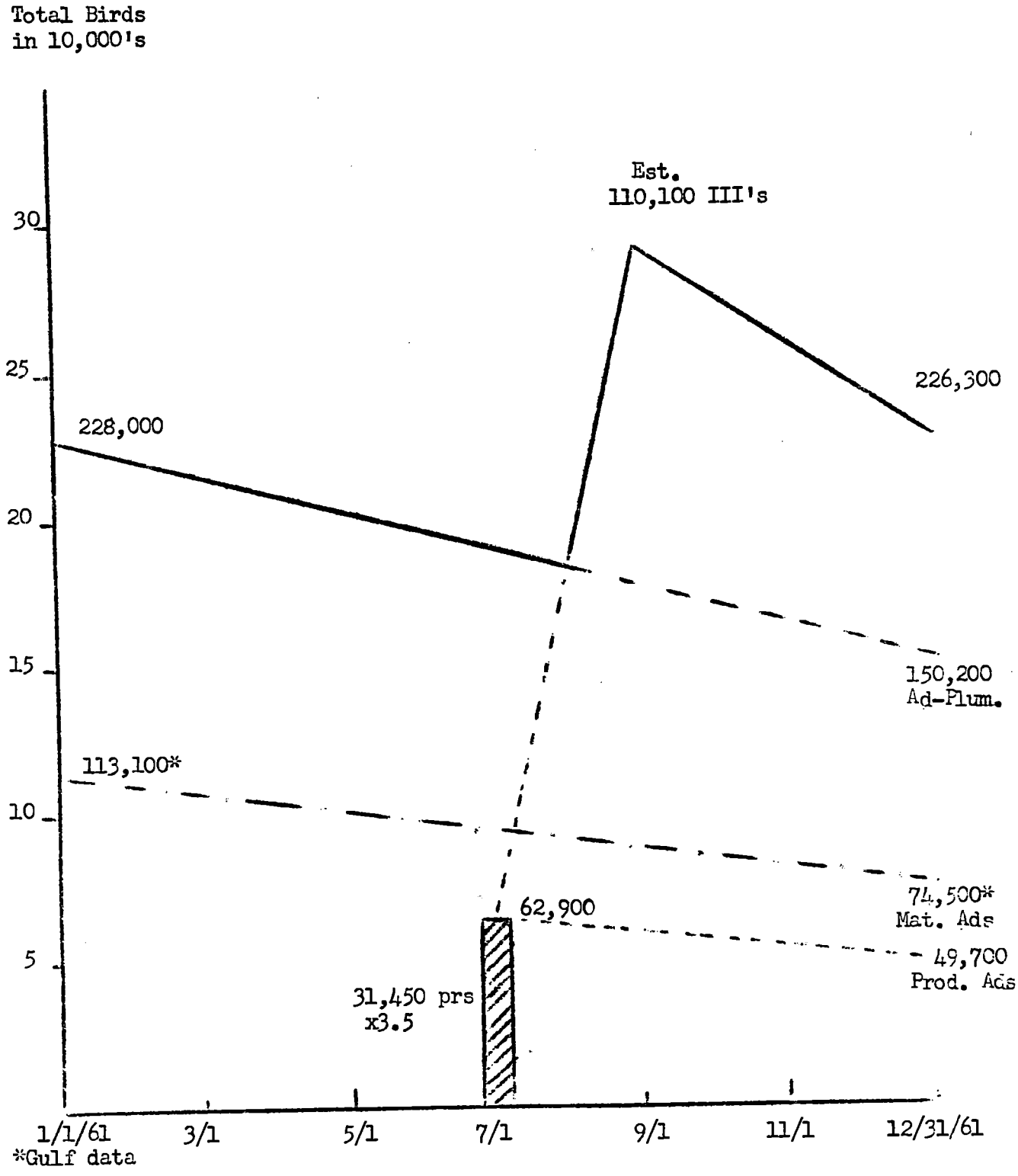
*Pacific surveys by Jensen and Cooperators, Central Flyway by Stutzenbaker, Chamberlain, and cooperators; Mississippi by Lynch, Andrews and cooperators.

Figure D, 1961 Season, Whitefront (Continental)



The whitefront "broke even" during 1961, having gone into that calendar year with 228,000 birds and ending the year with 226,000. Annual mortality among adults and subadults amounted to about 35% of the January 1961 population. This mortality, which appears to be quite normal for many goose populations, was compensated by an annual increment (net as of December 31) of about 76,000 first-winter young. This is not to say that the 1961 nesting was outstanding, for only 2/3 of whitefronts old enough (24 months) to nest in June 1961, managed to bring young to the wintering-grounds. ~~Nearly all "old timers" (whitefronts 36 months old in June 1961) could have been productive adults indicated in Figure D amount to only 2/3 of these older birds.~~ (tentative determination, since the present level of these older birds has been set on the basis of 1960 Gulf data only).

The satisfactory nesting of the whitefront in 1961 under conditions that proved almost disastrous for some other Arctic breeders, constrains us to review some of last year's whitefront discussion (page 12 in our 1960 Report). For lack of better data, that disputation had applied productivity data, gotten from Gulf whitefronts only, to the continental whitefront population for the period 1956-60. From this emerged a hypothetical picture of the whitefront as a population that was subject to very great annual mortality, yet seemed able to survive because of superlative reproduction. Immediately we wondered what might happen to the species should it suffer a nesting failure one year. (Altho with sly cunning, the perpetrater of this disputation left himself with an "out" on page 16 of that report).

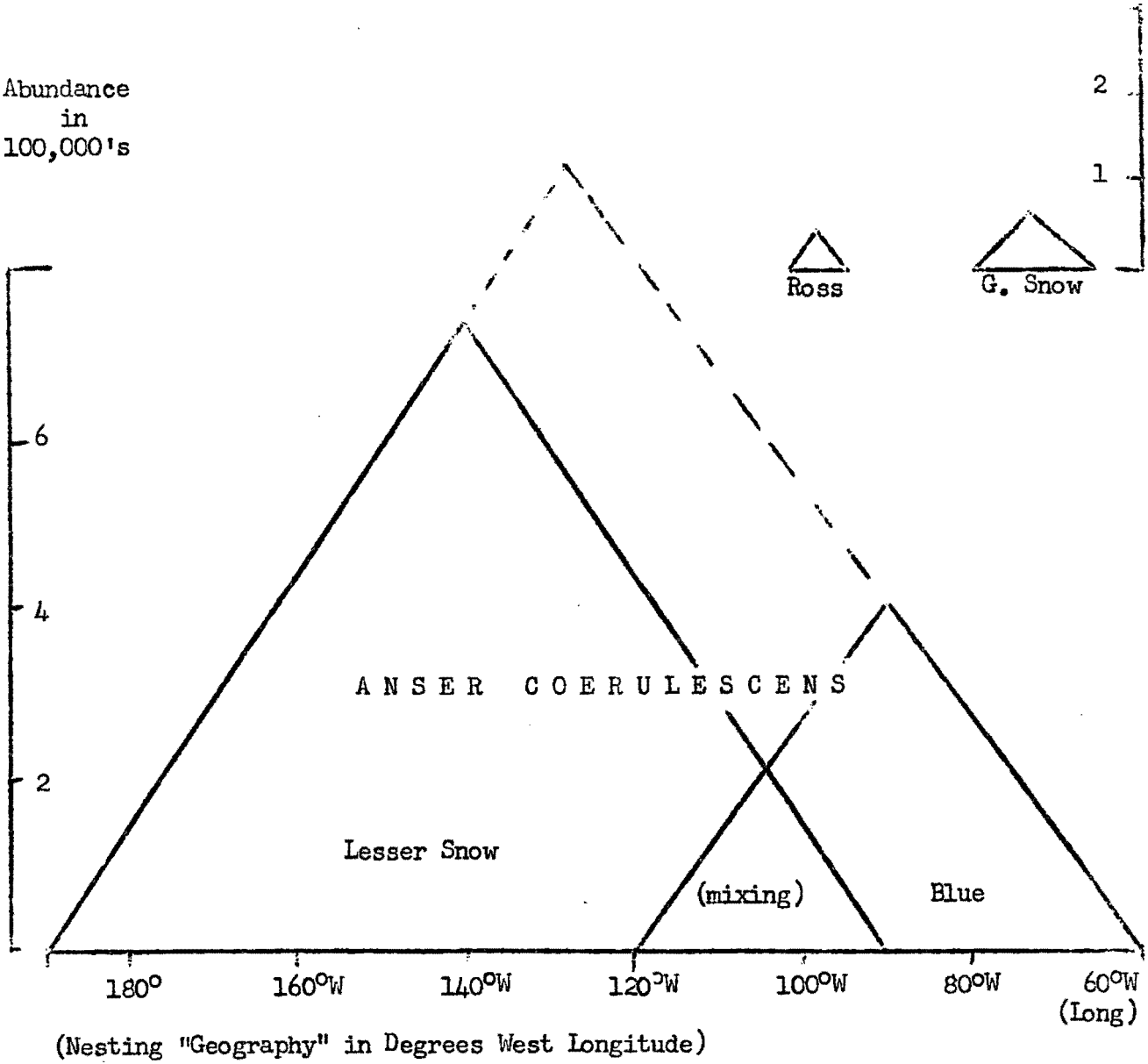
It now seems as though the "out" may have been a wise precaution. The whitefront, in its 1961 nesting performance, gave hint of having remarkably good nesting biology. Weather is undoubtedly the greatest single obstacle to successful reproduction among the Arctic breeding birds and predation is probably the next most important problem. Storms and other unfavorable meteorological conditions can cover a lot of the nesting territory of a species, and may seep into every nook and cranny of that territory one bad summer so that no nest is overlooked. Predation is often a threat to colonial nesters, and on occasion is so widespread as to menace large regions. A species can escape (or at least partially-avoid) these obstacles to annual reproduction only if it is blessed with a breeding range so extensive or so diversified that no one accident of weather or predation can affect all nesting birds. The lesser snow is endowed with such a nesting range (at least in its linear extent East to West, although that range is comparatively narrow in its N-S dimensions). The remarkable whitefront may be even better-endowed, for its breeding range in the Far North is rather elongated (SE to NW), comparatively wide North to South, and is not confined to coastal or insular sites but instead is greatly diversified. Furthermore, individual whitefront nests are usually dispersed rather widely in any one breeding area, and so should be reasonably secure from the predation that sometimes plagues the more compact colonies of other geese.

The whitefront goes into the 1962 nesting with some favorable omens. Its January 1962 level of 150,000 potential breeders is 1/3 higher than the level at the start of 1961, and the proportion of these 1962 birds that are experienced nesters should be correspondingly high. The foregoing figures apply to the Continental whitefront population. The comparatively small but highly-esteemed Great Plains segments of that population (that winter in SW Louisiana, Texas and Mexico) are blessed with a breeding potential for 1962 that is even greater (relative to their total numbers), and while these Central-Mississippi Flyway whitefronts did not do at all well in their 1961 nesting, their early prospects for their next season are encouraging.

The above discussion assumes that most subadult whitefronts reach sexual maturity at 24 months of age (altho not all of these newly-"eligible" breeders will be successful in their first nesting if weather is poor or there is serious competition with older birds for limited nest-sites). This determination of breeding age is inferential, and at present is only tentative for the whitefront. In the case of other geese for which we now have detailed historical records of annual productivity and mortality (Tables 10, 11 and 12), it is obvious that those species could not make good their known vital statistics unless a very high proportion of 24-month-old geese were able to produce young. Given 3 consecutive years of the sort of whitefront info we were able to get in the fall of 1961, we will be able to make more positive determination of age-to-breeding in the white-fronted goose.

FIGURE E, "SNOW" GEESE POPULATION PYRAMIDS

(Numerical and geographical positions)



(Nesting "Geography" in Degrees West Longitude)

PART VI. AVERAGE GROUP AS AN INDICATOR OF PRODUCTIVITY IN THE CANADA GEESE

There is considerable evidence that 1961 nesting success was generally only fair among the canada geese, and in some localities must have been decidedly poor. Comparatively few 1st-winter young canadas were tallied in fall 1961 banding operations and in age-ratio records of canadas bagged by hunters in the 1961-2 season.

It is interesting to note that the "Average-group" records we received during the fall of 1961 (Table 15), while not comprehensive for any one population, suggest a similar picture of canada productivity that was seldom better than fair, and in many cases was quite low.

And that, unfortunately, is about all we can say right now regarding 1961 reproductive success among the canada geese, other than to mention that total populations in the fall of 1961 seem to substantiate the above comments. (It is with some chagrin that Ye Compiler of a "North American Geese" compendium that goes into such intimate detail for the other species, admits that so little is known about the most important goose on the list.)

Better canada goose info seems to be in the offing. Our present kit of research and management tools (trap-records, banding, total inventories, etc.) is to be supplemented in the fall of 1962 by a nation-wide systematic collection of canada goose-tails. From this should come some real substantial information each year as to relative productivity among the canadas.

Meanwhile the "Average-group" appraisal of canada annual productivity has passed many tests, and this method now seems ready to assume an important place in our tool-kit. When first proposed (1/, 2/), the group method was strongly challenged (3/), but certain objections that had been raised were subsequently examined (4/) and laid to rest (5/).

(1/) Elder and Elder. 1949. Wilson Bulletin, 61(3): 133-140.
(2/) Hanson and Smith. 1950. Bulletin Illinois Natural History Survey 25(3): 67 - 210.
(3/) Lebret, T. 1956. Ardea, 44(4): 284-288.
(4/) Lynch, J. and Singleton, J. R., mimeo 8/20/59, rev. 8/30/60. Winter Appraisals of Productivity and Mortality for Canada Geese. 5pp. On file Patuxent and Lafayette.
(5/) Lynch, John J. et al. 1961. "1960 Productivity in N. American Geese, Part VI", mimeo, on file Patuxent and Lafayette.

FIGURE F. FIELD RECORD, AVERAGE GROUP

Locality: _____ Total size of flock: _____ Date: _____ Time: _____

Groups of:	1	2	3	4	5	6	7	8	9	10	Over 10 (actual # in group)
Tot. Birds / # Groups											

= _____ geese / groups = Av. Group _____

Our 1961 average-group studies showed that observers, regardless of their prior training or experience, could get very consistent results with this method for all species of geese (including the subspecies of canadas).

No one of these tools is offered as a substitute for another. In view of our present dearth of vital info on some aspects of canada goose management, every tool may be of value in supplementing or complementing other fact-finding expedients. For example, productivity info from tail-collections will help interpret average-group records, and the latter in turn can serve to guide banding and other operations. Group counts promise to give us productivity info for populations (rather than kill), and this info will be available quite early each fall and (if gotten from a quick and simultaneous reading at all concentration points of a population) will not be "diluted" by "turnover" of migrants nor by time-lapse in collection of sample.

We therefore urge the launching, in the fall of 1962, of a "one-shot" average-group count of canada geese, this to be made for the sole purpose of determining 1962 productivity in the various major population units of canadas (and subspp.). If this plan proves acceptable to all concerned, the count would be organized by Flyways, and would be run at such time in early fall as most canadas have moved south out of the "Bush", but before hunting has shattered too badly the familial and other groupings we seek to exploit. Each Flyway Representative might designate a period of 2 or 3 consecutive days this fall during which average-group counts would be made simultaneously at all canada concentration points in the Flyway or in the range of any one subpopulation.

Instructions for making these counts are given in Item 1 of Part IX in this report, and sample Field Record is illustrated in Figure F. Briefly, all goose flocks are made up of "groups", not just individual birds. At certain times these groups are very conspicuous, especially when flying geese are coming in for a landing. All groups of 10 birds or less (singles included) are tallied; the total number of birds recorded, divided by the number of groups they represent, is the "Average-group".

The data gathered during these counts, together with a figure as to the total number of canada geese in the vicinity at the time and thought to be represented by the data, are to be forwarded to appropriate Flyway Representative. (Observers who want to get a rough idea of productivity in their local flocks can convert their average-group figure to an approximate percent-young figure by using Figure G in this 1961 Report; but it might be well to read Item 6 of Part VII before trying any such interpretation of later-season counts).

This brings up the "roundelay" of average-group counts that was to be run thru the winter season, so as to monitor hunting-season mortality. We now see that we were overly-ambitious in trying to employ average-group counts to measure hunting mortality as well as annual productivity. A one-shot simultaneous group appraisal made early in the fall will provide us with good information as to a season's productivity in any major population segment of the canada geese. But the average-group data we have gotten from subsequent series of late-fall and winter counts, whether made on individual flocks or larger population segments, thus far defies interpretation, for reasons explained in Item 6 of Part VII in the present report. So we now endorse only the single early-fall average-group appraisal; the running of canada group-counts at intervals thruout the hunting season and beyond is not recommended for operational use at this time, other than by those researchers who are interested in exploring further the intricacies of winter-group interpretation.

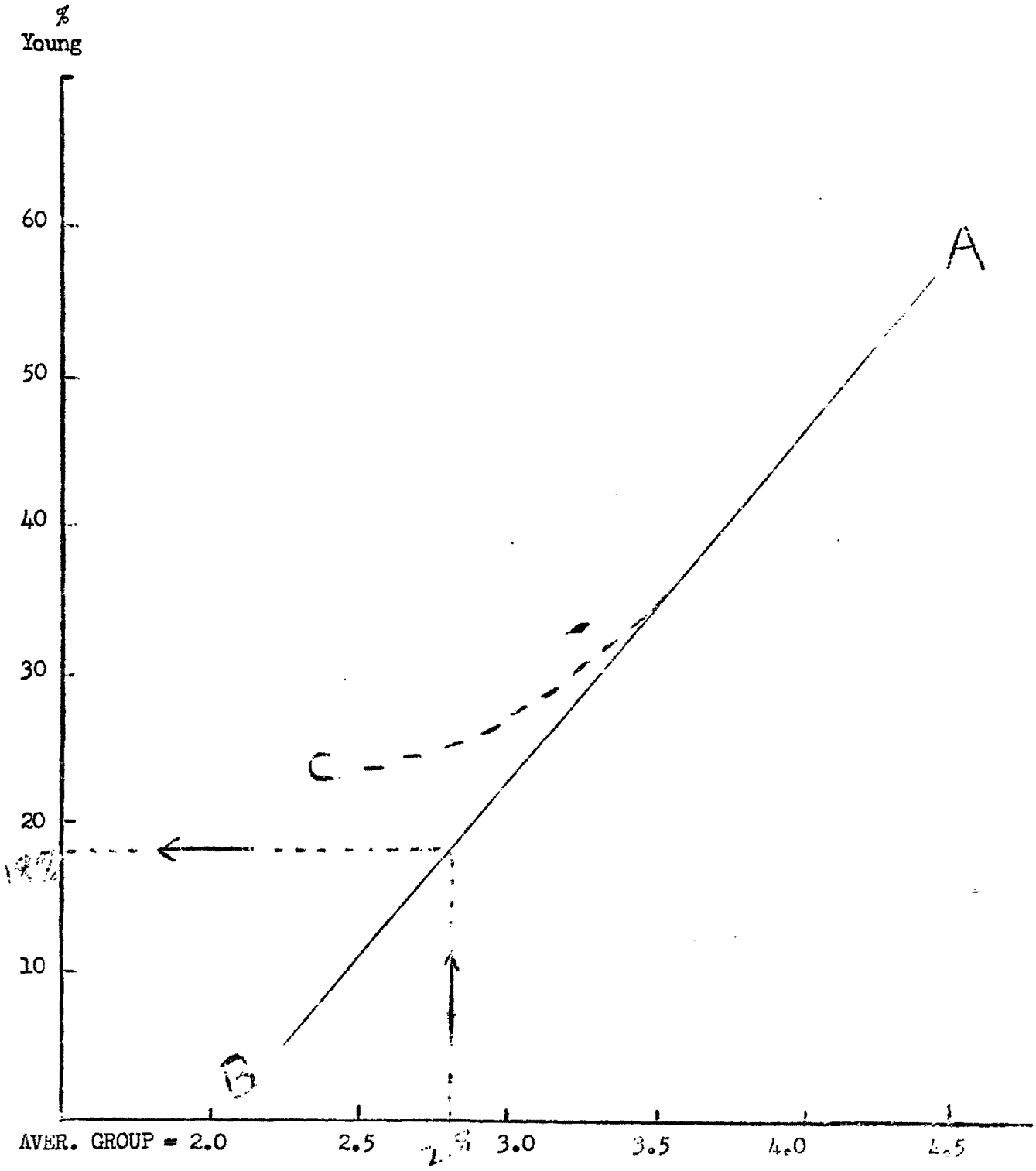
This does not mean that we plan to abandon entirely the idea of measuring canada goose mortality. We can now determine "total annual mortality" for any goose population for which we have a fall percent-young figure and a reliable estimate of total birds in the population at that time. This determination is illustrated graphically in our Population Plots (figures A, B, C, and D in the current report). A single early-fall group-count such as we now propose would give us the % young figure needed for this determination, and total population figures will be available from periodic inventories.

But the late-fall and winter average-group info does not yet shed much light on hunting mortality, and won't until research finds some way of interpreting the promising but perplexing data produced by late-season group-counts.

FIGURE 6. AVERAGE GROUP AND EQUIVALENT PERCENT YOUNG (Tentative)

line A-B = direct correlation between early-fall average group and % young (idealized from blue-snow and whitefront records).

line A-C = skewed line produced by average-group counts made later in winter, especially in heavily-hunted flocks.



PART VII. OTHER APPRAISALS

The fall and winter surveys we now use to appraise goose productivity may be modified for use with other birds. Eligible for such appraisal are: (1) those species wherein 1st-winter young have plumage that is different from all older birds (the swans, brants, cranes and some other waders, many sea birds, and probably all N. American geese except canadas); (2) species like the canada wherein familial, mating, yearling and other groupings persist throughout the winter period even though plumage of young is not conspicuously different from that of older birds; and (3) species wherein 1st-winter young have plumage that resembles the adult female but is different from that of the adult male. Some species like the blue, snow and white-fronted geese are blessed with several of these diagnostic features (plumage and groupings), and so we have used them as "guinea-fowl" in developing survey methods for other species.

1. Whistling Swan. At Lower Souris in N. Dakota, M. C. Hammond's 1961 fall surveys show that 8.0% of 1024 swans in his records were young, in broods that averaged 2.34 cygnets at that time of year (October); of swans in "adult plumage", 7.3% were accompanied by young. Al Geis reports the following from Atlantic Coast swans (Jan. 18-19, 1962): 1,965 recorded at Chesapeake Bay, Chester and Choptank Rivers, of which 15.1% were young; 171 birds at Back Bay, Virginia of which 13.5% were young; and 126 swans at Mackay Island, N. C., of which 15.1% were young. Karl Bednarik and Ed Bosak report that 11.4% of 921 spring-migrant swans stopping in Ohio cornfields in March 1962 were young. These figures on prevalence of young birds suggest that 1961 was not a very productive year for the whistling swan, although our information on this species is still too fragmentary to make any firm pronouncements in that regard. We do not yet know with certainty the age at which these birds reach sexual maturity (other than some observations that may be more applicable to individual birds than to the species). If fall appraisals of swan productivity and total numbers are pursued for several consecutive years, we will be able, perhaps within the next 3 years, to determine age-to-breeding in the whistling swan.

2. Ross Goose. This species has not yet been surveyed extensively in the course of our regular productivity appraisals, although E. C. Barney and Don White got a few Ross records at Merced National Wildlife Refuge in California, indicating only 1 family with 1 gosling identified in 52 birds. In the fall 1961 Saskatchewan bandings, Alex Dzubin reports that only 3.3% of 242 Ross geese in his trap-records were young-of-the-year. Apparently this species had very poor reproductive success in the 1961 season.

3. Brant, Atlantic and Pacific. No field-appraisal data are available, but the Migratory Birds Populations Station at Patuxent reports: of 74 Atlantic brant in the fall 1961 wing collection, only 1 was from a young bird; and wing records from California show 7 young in a collection of 30 black brant. This suggests very poor 1961 productivity, especially in the Eastern Arctic, among these coastal-nesting birds.

4. Scaup and other divers. We hoped to catch Gulf scaup last fall at a time when all adults males were out of eclipse plumage and all young males still looked like hens. Using aerial color photos of wintering rafts, we were going to tally "whitebacks-vs-browns", and determine probable % young via a ridiculously-simple expedient. But when our scaup arrived in Louisiana and Texas the 1st week in November, many young drakes were already spotted up so much that our air photos could not be interpreted. Mebbe some northern observers could catch scaup early enough in fall to try this dodge. And there are also the goldeneyes, eiders, etc. that may respond to such approach.

5. Development of "Conversion Chart" to determine percentage young from Average-Group Records. In previous reports we described how the old idea of determining canada productivity via "average-group" counts was reexamined in the light of recent blue, snow and whitefront data, and certain objections to the method were refuted. Out of all this came a chart like Figure G in this report, which theoretically could be used to convert an average-group determination to an equivalent percent-young in canada flocks. However, we recognized that the data upon which this chart was based were from blues, snows, and other species wherein young and families could be detected in the field, and that canada goose counts could not be so discerning. So we asked that observers get average-group info from canada flocks wherein % young could also be determined by trapping or other means. The response to this plea produced a wealth of very credible average group records for canadas (of several subspp.), but not enough supporting age-data to construct a "conversion chart" that would have been "built with canada data, for canadas". And it may be a few years before supporting age-data for canadas becomes available. So we now propose to construct tentative charts, using early-fall blue-snow and whitefront data (from special counts), and to employ these to interpret canada average-group records. This tentative conversion of canada average-group to canada % young (using blue-snow or a whitefront chart) will in no way compromise the historical value of annual canada group records; the latter can be re-interpreted in years to come when a better canada chart becomes available. In the fall of 1961 we were able to pin down the lower ends of the diagonal on our blue-snow and whitefront charts, thanks to very low productivity among the flocks with which we worked. In the fall of 1962 we hope to get enough intermediate- and high-productivity records to complete these charts. Most of this work will be done by Gulf Coast workers, but if anyone else wants to help, we will be eternally grateful for such assistance. Write Lafayette for details.

6. Periodic Average-group Counts to Monitor Winter Mortality. We are setting aside, at least temporarily, the idea of making canada average-group counts at intervals throughout the winter season, in favor of a "one-shot" early fall count that will determine annual productivity. It would indeed be desirable to have some way of monitoring canada mortality through the season, and periodic average-group determination may eventually offer a method of doing this job. But we have our hands full right now, trying to make an operational venture of the single fall appraisal of canada productivity. If anyone is interested in pursuing the mortality biz on an exploratory basis, quite a bit of info on this subject can be gotten from periodic blue-snow and whitefront appraisals, wherein such matters as "flocks of 1", stray young, 1-ad families, etc. can be examined. We now begin to see that the drastic drop in average-group that almost always takes place during the hunting season is not so much a direct indication of "mortality", but rather a reflection of "the survival of remnants of groups" that were broken up by hunting. In an unhunted goose population, there should not be many groups smaller than 2, for any single survivors of mated pairs or other functional groups that were broken up by natural mortality would probably form new groupings almost as fast as other groups were broken up. But when a goose-population is gunned, hunters do more than extract individual birds; they shake up the entire social organization of that population so that as many groups are shattered within a few short weeks as might otherwise have been broken up over a period of many months. It takes time for survivors to form new associations, which is probably the reason for the many "groups of 1" in the heavily-hunted goose-flocks, and the late-season depressed average-group (that skews to the left of diagonal "A-B" on our charts and tends to follow a curved line like "A-C" in Figure G of this report). Incidently, the Atlantic snows would be a fertile field for group studies in a relatively unhunted population, and the Rochester, Minnesota flock of "Big" canadas might also serve as another "control" population. Spring group-counts of snows and whitefronts during northward migration might tell us when these "groups of 1" form new associations.

7. Special studies. In this goose biz, we are often hard-put to explain the relationship between one batch of data and another. For example, is the age-ratio in a trapped sample the same as the age-ratio in the population being trapped? And how does age-ratio in the kill (wing-studies, etc.) stack up against the population age-ratio? Mebbe some of these answers can be gotten from areas where geese, especially whitefronts and snows, are simultaneously being banded, shot, and glommed by regular productivity observers and average-group counters. A splendid start has been made in this direction by M. C. Hammond, L. Schoonover and C. D. MacInnes in the Dakotas, and by Alex Dzubin and Harvey Miller in Saskatchewan (see Table 14), and their work is worth trying in other places. Even canada goose workers will be interested in this business, for the snow-whitefront work may produce "canada" goose info that can never be gotten from canadas.

8. Appraisals by plane: Aircraft have many uses in winter appraisals of waterfowl productivity. Aerial census is essential in determining total goose populations of remote regions, and aerial scouting is most helpful in locating wintering flocks, getting some rough idea as to their variability, and planning how they can be reached by ground observers who make the more detailed appraisal. Direct and detailed appraisal by means of air observation was tried on Atlantic swans this fall by Al Geis, Walt Crissey, and C. F. Kaczynski; they were favorably impressed by the obvious advantages of air-appraisal (good distribution of sample among all wintering flocks, speed, economy of effort, etc.), but report that aerial observers tend to overlook a certain percentage of immature birds, and that special ground-counts might be needed to size-up this factor of error. The use of aerial color-photography has been tried by Gulf observers; while this method seemed at first to have many advantages, it produced only a percent-young figure with no supporting family data, and the job of processing and interpretation of photos proved to be more time-consuming (and less informative) than the standard field-counts by ground crews. Ed Addy and Jack Fentriss tried Atlantic snow appraisals from taxiing as well as low-flying aircraft, and report good results.

PART VIII. NOTES ON WINTERING CONDITIONS AND WINTER WELFARE

On the Gulf Coast, most of the winter ranges of geese were in splendid condition by October 1961. The coastal marshes had been so dry during the preceeding summer that wild millet (Echinochloa, spp.), fall panic (Panicum dichotomiflorum), and other annuals thrived, and these plants managed to mature their season's seed crop before Hurricane "Carla" struck in mid-September.

"Carla" swept the coasts of Texas and southwest Louisiana. While the high tides, destructive winds, and human suffering that accompanied this great storm were widely publicized, the coastal region also received 5 consecutive days of torrential (and for the most part very welcome) rains. This rain-water served to reduce salinities in the marshes that were invaded by storm tides, and generally arrested a drougth that up to then had been assuming serious proportions thruout the Gulf region.

Subsequent fall weather was mild and generally favorable for the southward migration, and a large number of migrant geese arrived on their Gulf wintering-grounds in the period October 15-20. One concentration of whitefronts at Lacassine N.W. Refuge in Louisiana grew in numbers during this period until 37,200 were tallied there on October 20. No killing frosts were experienced on the Gulf Coast until early December, so the ricefields remained a lush green, and there was much "second-heading" of rice. Warm fall weather kept the coastal marshes too green for extensive burning, so geese of all species continued their invasion of new marshes and agricultural lands (as reported in detail in 1960). Blues and snows again shattered some of their old feeding traditions, this time by utterly laying waste a dense stand of southern bullrush (Scirpus californicus), at Louisiana's Rockefeller Refuge.

Midwinter rains were more than ample to keep our Gulf geese happy, but their joy was not shared by Louisiana and Texas hunters. Near-flood conditions developed in some of the goose-hunting regions following heavy rains in early December, and geese scattered out in all directions. Furthermore, most wintering flocks had comparatively few young geese that might fraternize with hunters, while the sagacious adult and subadult geese already knew too much about decoys, blinds and goose-calls to be cooperative in the matter of "being harvested".

Then came the "Big Freeze" of January 1962. This spell of cold weather broke records for low temperature, but fortunately the critical period lasted only about 4 days. We saw no evidence that any wintering geese were hurt or even seriously inconvenienced by the cold weather and ice, altho some flocks that had been wintering in the relatively dry ricefields were seen fleeing towards the coastal marshes on the first day of the cold. A few minutes after these flites had passed by, we learned (much to our discomfort) that the birds were running ahead of a very nasty freezing rain, and apparently were seeking deep open water where they could safely weather this real danger to all winged creatures.

Reports from the Pacific Flyway (Jensen) tell of excellent wintering conditions for geese in California. Nothing untoward had been reported from the winter ranges of the Atlantic Coast geese, until an ocean storm early in March 1962 ravaged the South Atlantic seaboard. It is not yet known just how the Atlantic goose-ranges will be affected by that storm. The long-range outcome of such cataclysm is usually greatly beneficial to many forms of wildlife, even tho immediate consequences may seem terrible. Ocean storms are, after all, a quite normal feature of the ecology of coastal environments.

During the past 2 years we learned a little something more about those blues and snows that sometimes spend the summer on the Gulf "wintering-grounds". Every year there are a few of these "stayovers", and small flocks of several hundred birds each may be seen any summer that follows a year of high nesting success. Since many of these nonmigrants show remnants of 1st-winter plumage, it was first thought that they represented late-developing or retarded young from the previous nesting season. In July 1961 a dozen of these stayovers were caught near the Lacassine Refuge during midsummer moult. These were kept under observation at Lafayette, and aviculturist C. R. Lynch reports that all proved to be slightly incapacitated because of gunshot injuries or disease. One died, showing the classical syndrome and all post-mortem aspects of avian tuberculosis. Apparently these summering geese are for the most part "culls", representing the slightly-injured, sick or otherwise sub-standard individuals that might be expected in any large population of birds. While a few of the more healthy specimens may attempt to nest (one brood of blues was identified at Sabine NW Refuge in 1960 and we have an unverified report of nesting blues at Little Chenier, Louisiana in 1961), many stayovers get themselves involved in a particularly nasty problem of damage to germinating rice. Thus a few hundred geese or even a few dozen can cause a crop-depredations problem all out of proportion to their numbers or importance.

PART IX. HINTS FOR COOPERATORS

In our 1960 Report, Part IX described in some detail the field procedures used in making our regular appraisals of goose productivity. Now that fall appraisals of canada goose productivity are becoming feasible, we present below a description of the "Average Group" method of appraising fall percent young. And, in response to many inquiries, we also describe some "training-devices and standards" that have been found to be very useful in the all-important job of estimating total numbers of geese.

1. Suggestions for making Average-group Counts: The size of the "Average-group" in fall concentrations of geese seems to vary directly with the percentage of young. When the average-group is down to 2 birds or thereabouts, there are probably few or no young present; when average-group runs 5 or better, 50% or more of fall geese may be young-of-the-year. Group counts of canadas (of any race), if made in fall at times when these groups are most conspicuous, should therefore give us a very simple means of determining annual productivity via fall age-ratio. Field method calls for the methodical scanning of goose-flocks that are landing into a feeding area or roost, and the recording of the number of birds in each small group (of 10 birds or less, singles included) that comes in. The total number of birds recorded, divided by the number of groups they represent, is the "Average-group"; the latter figure is to be converted to equivalent percent young via a simple chart we will have prepared by November 1962 ..... These fall flocks of geese are not just casual aggregations of individual birds. They are congregations of small, enduring social groups that represent families, mated pairs, yearlings in old brood-remnants or "pre-mating" pairs, orphan young, and stray singles. Family groups usually run to 4, 5, 6, or 7 birds, whereas the other groupings are of 2 birds or thereabouts; the more families present, the larger the "Average-group" figure. Groupings are most conspicuous when geese are going about their normal pursuits. They may not show up well when geese are excited or alarmed, or are coming to bait or small protected areas where they are accustomed to "falling in" en masse without the usual precautionary circling and scouting.....So, instead of offering detailed instructions for this work, we would merely point out that groups are the "building-blocks" that make up fall flocks of canadas (and other geese, swans, brants and cranes), and if one looks long enough, he will see them sort themselves out of the larger flite-formations. When several thousand geese come falling into a small baited area like somebody unloading coal, that would not be a good time to look for groups. Wait until the geese start behaving like geese (instead of wards of the Guv'mint). Don't worry if an incoming bunch of 12 geese breaks up first into 3 groups of 2-6-4, then reforms to groups of 4-4-4

and thence to 3-5-4, etc.; so long as the 12 birds break up into 3 groups, the "Average-group" is 4. The new observer will encounter many such anomalies, all of which seem to challenge the validity of the method. We now have a long and almost monotonously-consistent record of correlation between fall average-group in the geese and their percent young, which clearly demonstrates that the method can be made to work.

2. Average Group-counts to Supplement Blue-Snow and Whitefront Appraisals: Our average-group studies paid an unexpected dividend in the fall of 1961. Blues, snows and whitefronts in the Gulf region do not come to any one refuge or other concentration point, where we might glom the whole works in a single forenoon. They are scattered all over thousands of square miles of marsh, prairie and rice fields, and formerly we had to chase down each major concentration to be sure that our appraisal sample was being properly distributed. But now, while we have one flock under examination, we get its average-group as well as regular productivity info. Then, as distant flocks of blues, snows and whitefronts are flushed by passing aircraft or other disturbance, we quickly get their "average-group". This way we know whether or not we need make a special effort to survey the distant flocks. Often the group reading for the latter is not much different from that of the flock under observation, in which case we can save ourselves a lot of totally unnecessary bog-trotting. The reliability of this dodge has been checked repeatedly by special ground and air observation in the Gulf region, and it holds up very well. It may be worth trying in other regions.

3. Estimates of Total Numbers*: Goose "counts" are visual estimates, usually made from aircraft, of total numbers of birds in a concentration. These counts present fewer problems and can attain greater accuracy than census of some other waterfowl. Most geese frequent open terrain during the winter period, and usually all birds take wing simultaneously when a goose flock is approached by an aircraft. Unlike some ducks of the wooded swamps or large open waters, all wintering geese can be found with adequate search, and since they can be seen, they can be enumerated. Furthermore the application of productivity data to total population figures over a period of years provides a means of monitoring the credibility (if not the absolute accuracy) of the historical record of numerical estimates for a species .....Census work among the geese is not without problems. The task of locating all the important flocks in some far-flung wintering regions is somewhat formidable, and calls for experienced survey teams that have intimate knowledge of the birds and their ranges. Many of these winter ranges were almost inaccessible at one time, but now are flown at frequent intervals by private and business aircraft as well as by pilots of Conservation agencies. Most major goose concentrations are therefore under

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*from: Winter Appraisals of Annual Productivity in Blue, Snow and Whitefronted Geese, Lynch and Singleton, (Ms in process of publication).

almost constant surveillance throughout the winter period. Exchange of information among these many observers simplifies the task of locating concentrations..... The reliability of visual estimates of numbers in large flocks of birds is one aspect of census work that plagues all waterfowl students. Perhaps some of us are prone to think that an ability to estimate numbers is a faculty with which a few gifted individuals are endowed at birth. In reality, such ability is nothing more than a skill, that can be developed by anyone given normal eyesight and appropriate training. But development of such skill is of little avail if proficiency in the skill is not maintained and brought up to its highest possible level at the moment counts are to be made..... To improve accuracy of the estimates we employ a series of transparent plastic sheets, marked with crayon or "glass-marking" pencil to represent flocks of various numbers in various formations. Cellulose-acetate or -nitrate sheets were first used in open-cockpit aircraft, but the development of the vinyl, polyethylene and other plastics of 6- and 8-mil thickness gave us pliable sheets that proved much more convenient for use in modern aircraft. All observers, regardless of prior experience, seem to profit from a concentrated scanning of these training devices before making any aerial or ground counts. These sheets with their known numbers of "birds" can be held up to the aircraft windshield during flights, for comparison with actual flocks of geese against any background. Materials for these sheets may be found at upholstery and stationery counters in any dry-goods store, and their preparation requires no special equipment. In emergencies, we have used for this purpose standard plastic "freezer bags" that were marked with ball-point pen, and have even resorted to marking model "flocks" on the windshield of the aircraft. Other training devices are described by Spinner (1953). Any type of training device will serve the purpose, so long as it is used conscientiously to develop and maintain skills, and affords a standard for ready reference..... .....If a portion of the marked plastic sheet we described is deliberately folded back upon itself several times, it will serve to dramatize some facets of the problem of estimating numbers. Ground observers who approach a large flock of geese may see only a veritable maelstrom of objects, moving in many directions and on many planes, and have no way of determining the dimensions of this confused mass. To the aerial observer, the same flock will be seen as on the unfolded plastic sheet, where all objects are clearly visible, moving in one direction on a single plane. The advantages of aerial estimates in this instance are quite obvious. When very large concentrations of geese (as great as 50,000 birds or more) are encountered by aerial observers, the pilot may split them up into more convenient units by judicious herding.

4. Cautions: During the fall 1961 surveys, appraisal of some Gulf flocks showed a rather high proportion of families and young on the first few field-record sheets, and then a predominance of adult and subadult birds as counts were continued. Closer inspection of these flocks disclosed that productive adults and their young tended to remain about the periphery of the larger goose flocks, and did not mingle well with the adults and subadults that made up the "core" of such flocks. We have not actively sought to establish any "minimum samples" in field appraisals of blue, snow or white-fronted geese because discrepancies and anomalies such as the one just described are all too obvious in wild concentrations of living birds. Once an appraisal worker is in a favorable position to make these observations, he can get a large number of records just as easily as he can a small number. Since there is no particular need to worry about "how small a sample can one get by with", the observer can devote his full energies to getting a sample that is representative of the flock he is appraising. It has been our practice to start a new field-record sheet as soon as any one column is filled on the current sheet. By this expedient, the observer can detect variability among his birds by merely riffling back thru his earlier record sheets and comparing the lengths of the "family" and the "non-family" columns.

X. CONTRIBUTORS

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Addy, C. E.	(BSFW, Flyway Rep. Patuxent) Conducted Atlantic snow appraisals, and supervised canada counts.
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Ambrosen, Don	(BSFW, Back Bay NWR) Atlantic snow goose surveys.
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Chabreck, Robert	(Louisiana WL&F Comm.) SW Louisiana surveys.
Chamberlain, E. B.	(BSFW, Flyway Biol., Victoria, Tex.), Texas appraisals, and western Gulf aerial inventories.
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Crain, Ned	(La. Wildl. & Fish Comm.) Rockefeller Refuge surveys.
Crissey, W. F.	(BSFW, Patuxent) Experimental Swan appraisals

Daniel, Don	(BSFW, Sabine NWR) SW Louisiana goose appraisals.
DeLime, John	(BSFW, Reelfoot NWR) Reelfoot (Tenn.) canada counts.
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Gillett, James F.	(BSFW, Horicon NWR) Wisconsin goose surveys.
Green, Wm. E.	(BSFW, Minneapolis) Canada goose surveys.
Grieb, Jack R.	(Colorado Dept. G & F) Report "Central Flyway Lesser Canada Goose Flock", March 1962.
Hammond, M. C.	(BSFW, Lower Souris NWR) Whitefront and snow appraisals, and detailed study of grouping in "White-fronted goose Productivity studies" (1961).
Hansen, Henry A.	(BSFW, Juneau, Alaska) Appraisals of Lesser Scaup Productivity.
Hanson, Harold C.	(Ill. Nat. Hist. Survey) Canada goose surveys, average-group method.
Hanson, R. C.	(BSFW, Flyway Biol. Minneapolis), aerial inventories of geese, Miss. Flyway.
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Loga, Benny	(Louisiana WL&F Comm.) Pass-a-Loutre geese.
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McDaniel, Travis	(BSFW) Atlantic snow goose surveys.
McGilvrey, F. B.	(BSFW) Santee NWR canada geese.
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Table 1, 1961 Blue Goose Productivity

Field Data (%) & Indices	Louisiana 324,200	Texas 61,500	Continental 385,700
Adults			
In 1-Ad. Fam.	53 (0.40)	130 (2.56)	
INDEX	1,297	1,574	2,871 (0.74)
In 2-Ad. Fam.	782 (5.97)	440 (8.68)	
INDEX	19,355	5,338	24,694 (6.40)
Non-Fam.	11,520 (88.03)	3,774 (74.46)	
INDEX	285,393	45,793	331,185 (85.87)
TOTAL ADULTS	12,355 (94.40)	4,344 (85.70)	
INDEX	306,045	52,705	358,750 (93.01)
Young			
In Fam.	687 (5.26)	545 (10.75)	
INDEX	17,053	6,612	23,665 (6.14)
Orphan	45 (0.34)	180 (3.55)	
INDEX	1,102	2,183	3,285 (0.85)
TOTAL YOUNG	732 (5.60)	725 (14.30)	
INDEX	18,155	8,795	26,950 (6.99)
TOTAL GEESE	13,087 (100.00)	5,069 (100.0)	385,700

Tot. Fam. - 1-Ad. = 2,871
$\frac{1}{2}$ of 2-Ad. = 12,347
15,218 Families

Aver. Brood = $\frac{23,665 \text{ Family yg.}}{15,218 \text{ Fam.}} = 1.55$

Field % Prod. = $\frac{27,565 \text{ Prod. Ads.}}{358,750 \text{ Tot. Ads.}} = 7.68\%$

Table 2, Blue Goose, Field Records, Louisiana, Fall 1961

Localities & Dates	In Families			Other		Total Ads.	Total Imm.	Total Birds	% 1/ Imm.	% 2/ Prod.	Average 3/ Brood
	# Fam.	Ads.	Imm.	Ads.	Imm.						
3. Lacassine	11	22	16	127/38	--	149	16	165/49	9.7	14.8	1.5
5. Rockefeller	31	58	54	1157/560	—	1215	54	1269/591	4.3	4.8	1.7
6. Sabine (E)	19	35	35	1450/614	3/3	1485	38	1523/636	2.3	2.4	1.8
7. Thornwell	21	40	42	938/385	1/1	978	43	1021/407	4.2	4.1	2.0
8. Gueydan	59	111	85	1203/569	5/5	1314	90	1404/633	6.4	8.4	1.4
24. Pass a Loutre	194	375	299	3539/1462	21/19	3914	320	4234/1675	7.6	9.6	1.5
25. Marsh Island	9	17	12	457/186	—	474	12	486/195	2.5	3.6	1.3
27. Delta	65	119	98	1306/612	11/10	1425	109	1534/687	7.1	8.4	1.5
30. Esther	25	39	33	377/200	4/3	416	37	453/228	8.2	9.4	1.3
31. Sabine (W)	10	19	13	966/517	--	985	13	998/527	1.3	1.9	1.3

1/ $\frac{\text{Total young}}{\text{Total birds}}$ = % Imm.

2/ $\frac{\text{\# Adults having young}}{\text{Total in adult Plumage}}$ = Prod. (See Pop. Plot)

3/ $\frac{\text{\# Young "in Fam."}}{\text{\# of Fam.}}$

Table 3, Blue Goose Records, Texas Coast, Fall 1961

Localities & Dates	In Families			Other		Total Ads.	Total Imm.	Total Birds	% 1/ Imm.	% 2/ Prod.	Average 3/ Brood
	# Fam.	Ads.	Imm.	Ads.	Imm.						
9-10 Jefferson	78	125	103	476/207	47/26	601	150	751/311	19.9	20.7	1.3
10-11 Jefferson	52	88	85	488/202	26/20	576	111	687/274	16.1	15.3	1.6
12-15 Chambers	111	173	158	1518/728	68/52	1691	226	1917/891	11.8	10.2	1.4
17-19 Lissie	20	35	41	280/156	13/8	315	54	369/184	14.6	11.1	2.1
20 Lissie	14	24	22	195/106	5/5	219	27	246/125	11.0	10.9	1.6
21 Eagle Lake	63	103	118	739/390	11/7	842	129	971/460	13.2	12.2	1.8
22 Garwood	12	22	18	78/50	10/6	100	28	128/68	21.9	22.0	1.5
GRAND TOTAL	350	570	545	3774/1839	180/124	4344	725	5069/2313	14.3	13.1	1.6

1/ $\frac{\text{Total young}}{\text{Total birds}}$ = % Imm.

2/ $\frac{\text{\# Adults having young}}{\text{Total in adult Plumage}}$ = % Prod (See Pop. Plot)

3/ $\frac{\text{\# Young "in Fam."}}{\text{\# of Fam.}}$

Table 5, Lesser Snow Goose Records, Gulf Coast, Fall 1961

Localities & Dates	In Families			Other		Total Ads.	Total Imm.	Total Birds	% 1/ Imm.	% 2/ Prod.	Average 3/ Brood
	# Fam.	Ads.	Imm.	Ads.	Imm.						
La. Subtot. *	10	16	21	472/325	7/7	488	28	516/342	* 5.4	* 3.3	* 2.1
Texas, (9)	166	268	291	522/244	41/27	790	332	1122/437	29.6	33.9	1.7
Texas (10-12)	121	208	199	560/233	40/33	768	239	1007/387	23.7	27.1	1.6
Texas (13-14)	278	435	432	1605/740	133/87	2040	565	2605/1105	21.7	21.3	1.6
Texas, Lissie	688	1168	1225	4317/1754	175/115	5485	1400	6885/2557	20.3	21.3	1.8
Texas (22)	35	61	68	249/114	8/8	310	76	386/157	19.7	19.7	1.9
Subt. TEXAS	1288	2140	2215	7253/3085	397/270	9393	2612	12005/4643	21.8	22.8	1.7

1/ $\frac{\text{Total young}}{\text{Total birds}}$ = % Imm.

2/ $\frac{\text{\# Adults having young}}{\text{Total in adult Plumage}}$ = % Prod. (See Pop. Plot)

3/ $\frac{\text{\# Young "in Fam."}}{\text{\# of Fam.}}$

Table 6, Lesser Snow Goose Records, Pacific Flyway, Fall 1961

Localities & Dates	In Families			Other		Total Ads.	Total Imm.	Total Birds	% 1/ Imm.	% 2/ Prod.	Average 3/ Brood
	# Fam.	Ads.	Imm.	Ads.	Imm.						
Sacramento 12/8	(See *Tbt.)	255	257	606	24	861	281	1142	24.6	29.6	(See * Tdt.)
Sacramento 12/9		237	218	781	17	1018	235	1253	18.8	23.3	
Sacramento 12/10		617	581	2124	63	2741	644	3385	19.0	22.5	
Colusa 12/11		139	134	346	12	485	146	631	23.1	28.7	
Sutter 12/11		144	149	360	2	504	151	655	23.1	28.6	
Sacramento 12/12		218	187	601	21	819	208	1027	20.3	26.6	
GRAND TOTAL	856	1610	1526	4818	139	6428	1665	8093	20.6	25.1	1.8

1/ $\frac{\text{Total young}}{\text{Total birds}}$ = % Imm.

2/ $\frac{\text{\# Adults having young}}{\text{Total in adult Plumage}}$ = % Prod. (See Pop. Plot)

3/ $\frac{\text{\# Young "in Fam."}}{\text{\# of Fam.}}$

Table 7. Atlantic Snow Geese, Fall 1961

Localities and Dates	In Families			Other		Total Ads.	Total Imm.	Total Birds	% 1/ Imm.	% 2/ Prod.	Average 3/ Brood
	# Fam.	Ads.	Imm.	Ads.	Imm.						
Pocahontas (1)	4	7	6	199/96	1/1	206	7	213/101	3.3	3.4	1.5
Pocahontas (2)	—	--	—	146/76	--	146	--	146/76	0.0	0.0	--
Pocahontas (3)	--	--	—	185/94	—	185	—	185/94	0.0	0.0	--
Bodie Island	11	22	18	1045/418	—	1067	18	1085/429	1.7	2.1	1.6
Sheep Hills	2	3	2	878/498	2/2	881	4	885/502	0.5	0.3	1.0
GRAND TOTAL	17	32	26	2453/1182	3/3	2485	29	2514/1202	1.2	1.3	1.5

1/ $\frac{\text{Total young}}{\text{Total birds}}$ = % Imm.

2/ $\frac{\text{\#Adults having young}}{\text{Total in adult Plumage}}$ = % Prod. (See Pop. plot)

3/ $\frac{\text{\# Young "in Fam."}}{\text{\# of Fam.}}$

Table 8. Whitefront Productivity, 1961

Field Data (%) & Indices	Louisiana 20,010	Central 13,012	Pacific 193,295	Continental 226,317
Adults				
In 1-Ad. Fam.	6 (0.18)	157 (3.48)	128 (3.38)	
INDEX	36	453	6,533	7,022 (3.10)
In 2-Ad. Fam.	329 (9.63)	658 (14.58)	762 (20.10)	
INDEX	1,927	1,897	38,853	42,678 (18.86)
Non-Fam.	2641 (79.50)	2510 (55.62)	1517 (40.03)	
INDEX	15,908	7,237	77,376	100,520 (44.42)
TOT. ADULTS	2967 (89.31)	3325 (73.68)	2407 (63.51)	
INDEX	17,871	9,587	122,762	150,220 (66.38)
Young				
In Fam.	340 (10.24)	990 (21.93)	1188 (31.35)	
INDEX	2,049	2,854	60,598	65,501 (28.94)
Orphan	15 (0.45)	198 (4.39)	195 (5.14)	
INDEX	90	571	9,935	10,596 (4.68)
TOTAL YOUNG	355 (10.69)	1188 (26.32)	1383 (36.49)	
INDEX	2,139	3,425	70,533	76,097 (33.62)
TOTAL GEESE	3322 (100.0)	4513 (100.0)	3590 (100.0)	226,317

Tot. Fam. = 1-Ad. or 7,022
+ $\frac{1}{2}$ of 2-Ad. or 21,339

Aver. Br. = $\frac{65,501 \text{ Fam. Yg.}}{28,361 \text{ Fam.}}$ = 2.31 Av. Br.

Field % Prod. = $\frac{49,700 \text{ Prod. Ads.}}{150,220 \text{ Tot. Ads.}}$ = 33.08%

Table 10, Historical Record, Blue Goose Annual Productivity

(from wintering-grounds appraisals)

YEAR (Fall of:)	Percent Young	Ad:Subad:Young (in thous.)	Average Brood (Fall)	Field* % Prod.	True** % Prod.
1949	47.6	90:108:180	2.1	46.4	100.0
1950	35.5	111:101:117	2.1	37.3	71.2
1951	11.2	177: 97: 35	1.6	13.2	16.0
1952	48.5	179: 23:190	2.4	66.7	75.0
1953	38.9	157:148:195	2.2	51.0	99.0
1954	1.8	200:134: 6	1.6	1.6	2.7
1955	54.9	200: 4:247	2.7	75.7	77.0
1956	31.8	117:143:121	2.1	30.7	68.0
1957	46.1	156: 73:196	2.3	62.5	91.6
1958	16.3	154:129: 55	1.6	19.7	36.0
1959	51.4	202: 39:255	2.5	75.0	89.6
1960	32.2	186:175:171	2.2	38.3	75.0
1961	7.0	243:116: 27	1.6	7.7	11.4

* % of geese in adult plumage (including subadults) that brought young to the wintering-grounds.

** Probable % of mature adults (22 months of age or older) accompanied by broods in fall.

Table 12. Table 12. Historical Records Atlantic Snow Geese
(from winter appraisals)

YEAR (Fall of:	Dec. Pop.	% Young	Ad:Subad:Imm.	Average Brood	Field % Prod.	True % Prod. (of ads, 24 mths. or older
1956	34,788	33.8	(22.9) :11.8	2.99	43.6	
*1957	39,950	34.4	17.3: 8.9:13.7	2.34	38.7	58.5
*1958	48,249	3.1	**30.7:16.1: 1.5	2.22	2.6	2.6
*1959	52,929	42.7	29.4: 0.9:22.6	2.63	51.3	52.9
1960	67,140	34.1	25.3:18.9:22.9	2.30	40.3	70.3
1961	49,700	1.2	32.4:16.7: 0.6	1.53	1.3	1.9

* Over 80% of winter population photographed.

** Anomaly, may represent variable infiltration of western race (see discussion).

*** Percent of fully-mature (24 month-old and older) birds bringing young south.

Table 11, Historical Record, Lesser Snow Goose

(Gulf, Pacific, & Continental Productivity, from Winter Surveys)

YEAR (Fall of:)		Dec. Pop.	% Young	Ad:Subad:Imm.	Average Brood	Field % Prod.	% Prod. (of Ads. 24 mths or older
1948	(Gulf Only)		46.2		1.9	83.3	
1949	"		47.9		2.1	70.2	
1950	"	403,000	40.5		2.3	43.2	
1951	"	225,000	11.3		1.5	14.3	
1952	"	332,000	47.9		2.2	73.4	
1953	"	471,000	49.1		2.1	77.8	
1954	"	323,000	26.9		1.8	34.0	
1955	"	479,000	42.2	(No Texas Data)	2.6	44.3	
1956	Gulf	290,000	40.6		1.9	52.0	
	Pac.	351,000	25.5		2.3	17.3	
	Cont.	641,000	32.4	250:183:208	2.1	31.1	53.8
1957	Gulf	300,000	39.9		1.9	53.1	
	Pac.	317,000	32.8		2.2	33.1	
	Cont.	617,000	36.3	266:127:224	2.0	42.2	62.3
1958	Gulf	212,500	29.2		1.6	37.1	
	Pac.	388,100	20.1		1.9	19.7	
	Cont.	600,600	23.3	293:168:140	1.8	25.4	40.0
1959	Gulf	297,173	49.7		2.4	70.1	
	Pac.	360,000	38.2		2.3	49.3	
	Cont.	657,173	43.7	284: 86:287	2.3	58.4	75.0
1960	Gulf	265,400	41.3		2.0	50.2	
	Pac.	461,000	38.8		2.3	48.8	
	Cont.	726,400	39.8	246:191:289	2.3	49.3	87.5
1961	Gulf	191,200	17.9		1.7	18.1	
	Pac.	~~541,000~~	20.6		1.8	25.1	~~38.3~~
	Cont.	~~732,200~~	19.9	353:233:146	1.8	23.1	~~23.1~~

Table 13, Historical Record, Whitefronted Goose

Year (Fall of & Data Block	December Pop.	% Young	Ad:Subad:Young (In Thous)	Aver. Brood	Field % Prod.	True % Prod.
1956, Gulf Cont.	133,000	33.8		1.8	49.8	
1957, Gulf Cont.	165,300	46.3		1.8	62.1	
1958, Gulf Cont.	193,900	42.8		2.3	53.5	
1959, Gulf Cont.	215,200	51.6		2.6	62.1	
1960, Gulf Cont.	228,000	50.4		2.8	56.1	
*1961, Gulf	33,000	16.8		2.0	15.7	
Pacific	193,300	36.5		2.3	37.0	
Cont.	226,300	33.6	74.5:75.7:76.1	2.3	33.1	66.7

*First truly continental appraisal; see 1960 Report for reconstruction of possible continental picture from Gulf Coast appraisal data.

TABLE 14. LESSER SNOW, NORTHERN RECORDS

(Regular Appraisal, with special age-counts and band-trap records0

Species: Lesser Snow

Saskatchewan: Alex Dzubin

Month and Year: Fall 1961

Dakotas: Schoonover and McInnes

Localities & Dates	Records	In Families			Other		Total Ads.	Total Imm.	Total Birds	% 1/ Imm.	% 2/ Prod.	Average 3/ Brood
		# Fam.	Ads.	Imm.	Ads.	Imm.						
Saskatchewan	Reg.-Appr.	17	33	44	574	74	607	118	725	16.3	-	2.58
"	Band-Trap						385	23	408	5.6	-	-
S. Dakota	Reg.-Appr.	10	18	20	196/28	6/2	214	26	240/40	10.8	8.4	2.00
"	Reg.-Appr.	9	17	19	83/21	7/5	100	26	126/35	20.6	17.0	2.11
"	Separ. Ad-Juv.						355	64	419	15.3	-	-
"	Reg.-Appr.	16	28	33	90/21	11/5	118	44	162/42	27.2	23.7	2.06
"	Separ. Ad-Juv.						278 140	23 10	301 150	7.6 6.7	-	-
"	Band-Trap						529	158	687	23.0	-	-

TABLE 15. CANADA GOOSE AVERAGE GROUP RECORDS

Fall 1961	October			November			December			January 1962			Later
Area	1-10	11-20	21-31	1-10	11-20	21-30	1-10	11-20	21-31	1-10	11-20	21-31	
Horicon, Wisc.		1657/516 = 3.2											
Horseshoe Ill.			836/221 = 3.78			1270/306 = 4.15			1303/325 = 4.01			3871/1462 =2.65	1220/454 = 2.69
Reelfoot NWR				2350/568 = 4.14	535/131 = 4.08								
Tennessee NWR					354/64 = 5.39	230/44 = 5.23		283/64 = 4.42	331/69 = 4.79	174/63 = 3.28			
Swan L. Mo.	894/208 = 4.30	2924/757 = 3.86	638/189 = 3.38			288/76 = 3.79	298/85 = 3.51	409/118 = 3.47					
Santee					644/152 = 4.2	728/188 = 3.9	441/121 = 3.6						
Mattamuskeet N.C.			1158/359 = 3.23	3857/1346 = 2.87									
Rem. Farms Md.				3667/1442 = 2.54									

(Table 15 Continued)

Fall 1961	October			November			December			January			Later
Area	1-10	11-20	21-31	1-10	11-20	21-30	1-10	11-20	21-31	1-10	11-20	21-31	
Lissie, Texas			378/147 = 2.57										
Roosevelt L. Ariz.					208/50 = 4.16								
Merced NWR Calif.									112/28 = 4.0				
Ark. Valley (Grieb Report)					244/54 = 4.52	211/59 = 3.58		536/165 = 3.25					74/22 = 3.36